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The Institute of Vitreous Enamellers
The Welsh Engineers' and Founders' Association
The Foundry Trades' Equipment and Supplies Association

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Whose Fault?

The temporary assumption by the Government of extraordinary powers in many political, economic, and social spheres seems to suggest to some that in these directions they may slacken their own energies in furthering the country's cause, and that they should only await a suitable opportunity of criticising (usually destructively) the measures which may be adopted. All too frequently one hears of the ironfounder who says he is unable to obtain sufficient work. One even hears of those who write to the Iron and Steel Control to explain that they have but little work on hand, and to ask why has the Control not filled their order-books? Particularly is this attitude prevalent amongst certain of the "light castings" founders.

The present serious position (and it is serious that so much valuable plant is not working to full capacity and that so many highly skilled men should be idle) is in a large measure attributable to the founders themselves. Their actions and complaints suggest that because this conflict has disassociated the adjective "essential" from rain-water goods, window sashes and cookers, and has transferred it to armaments and munitions, and because new fields have to be searched for orders, the responsibility for the maximum effective utilisation of foundry plant and labour is transferred from employers to the Ministries of Supply and Labour. That the foundry executives cannot control their own businesses under modified conditions would, perhaps, be a harsh comment; but there does appear to be sufficient provocation to justify the accusation.

If complaining foundrymen make any constructive suggestions for the proper and maximum usage (and proper and maximum are today synonymous when applied to war production) of their individual facilities, it is often either to recommend that, failing the receipt of a Government contract, they should be permitted to revert to the production of the peacetime commodities, or to state that they are fully suited to the production of such-and-such an armament. Before making such suggestions, the founders should reflect upon the suitability of cast iron for the particular armament which they may wish to make, and should realise, unpleasant though it be, that this war is not being waged to ensure the continuation of relatively effortless management of certain classes of foundries. Many erroneous impressions seem to exist in the minds of some foundrymen concerning the utilisation of cast iron in munitions. In many cases the application of cast iron is severely limited, but in other branches of arms production, cast iron, and especially high-duty and/or alloy cast iron is successfully saving more costly ferrous and non-ferrous materials.

The cause of this position is not necessarily of very recent birth, neither is it purely a technical or a commercial question, but rather a combination of both. The most seriously affected foundries are those which were engaged in the production of light grey iron castings, and which followed the commercial and technical traditions of a generation ago. When the war came with its great demands for quick production of high-grade materials, these foundries found themselves to be unsuited for this task, in equipment and because of a lack of technical experience amongst employers and employees.

The shortage of equipment was not, of course, the fault of the foundryman. If he were able successfully and economically to fulfil his peacetime functions, there was naturally no incentive to install other plant in anticipation of a war which, up to the last, it was hoped to avert.

That some shortage of technicians should be found is, however, to be deprecated. To an ever increasing degree during the past two or three decades, have facilities been provided by industry itself and by other authorities, for the dissemination, in many ways, of a wealth of technical knowledge pertaining to foundrywork. This is not to suggest that every foundryman should have gained an intimate knowledge in all branches of the science and art of founding. Such would, of course, have been impossible; it does disclose, however, a weakness in the observed tendency towards a high degree of specialisation. It also suggests, which is more important, that those in the industry have not made full use of the facilities available.

For many years ironfounders have complained that engineers do not realise the advances which have been made in this material; that they still regard it as a fragile substance of varying characteristics and a tensile strength of eight tons per square inch. Upon whom does the responsibility lie for this state of affairs? Surely not upon the consumer. It is for the producer to give publicity to his product.

Quite a number of steps have been taken towards the correction of this conception; but

(*Continued overleaf.*)

War Damage Act, 1941

PRIVATE CHATTELS INSURANCE AND FREE COMPENSATION SCHEMES

To remove misunderstandings the Board of Trade wish to make it plain that:—

(*a*) It is not necessary to take out any policy of insurance to obtain the benefits of the Government's scheme of limited free compensation for war damage to furniture, clothing and other private chattels. Persons who do not want more protection than is provided by this scheme are not required to take any action unless and until their chattels have suffered damage. They should then apply to their Local Information Centre or the District Valuer for their district for a Form of Claim, which should be filled in and sent to the District Valuer;

(*b*) Persons who want more cover than that automatically provided by the scheme of limited free compensation can secure the additional cover only by taking out a policy of insurance under the Private Chattels Insurance Scheme, which operates with effect from May 1, 1941. The period of grace allowed for taking out policies will expire on May 31, 1941, and no extension is contemplated. Persons who have not insured by May 31 will be entitled only to the benefits of the limited free compensation scheme for damage to their private chattels between May 1, 1941, and the actual date on which they take out a policy of insurance. Applications should be sent at once to a Fire Insurance Company or Lloyd's Broker or others carrying on Insurance Agencies. Insurance is voluntary, and the Fire Insurance Companies and Lloyd's will not circularise their clients on this subject.

These arrangements apply to war damage to private chattels after April 30, 1941. Damage up to that date will be treated as if an insurance policy had been in force. No further action is required than the filling up of Form V.O.W.1, which is obtainable from the office of the Local Authority or of the District Valuer, Inland Revenue.

Concentration of Production

LIABILITY FOR TAXATION

In answer to a question asked by Mr. Loftus recently in the House of Commons on the taxation position of firms affected by the scheme for concentration of production, Capt. Waterhouse, Parliamentary Secretary to the Board of Trade, stated that the Chancellor of the Exchequer had agreed to the following arrangements:—

The Finance Bill includes provisions relating to the liability to taxation of concerns which are certified by the Board of Trade as being parties to approved arrangements for the concentration of production. The provisions will be to the following effect:

(1) For the purpose of computing Income Tax and Excess Profits Tax, the cessation of its production by a concern when a factory is closed, or the undertaking by a nucleus concern of new activities, in consequence of concentration arrangements approved by the Board of Trade, will not be treated as effecting a discontinuance of the business of the one or the setting up of a new business by the other.

(2) Any sum (except a sum of a capital nature or a sum payable under deduction of tax) payable as a result of an approved concentration arrangement to a closed concern by a nucleus concern shall be allowed as a deduction in computing the profits of the latter, and shall be treated as a trading receipt in computing the profits of the former.

(3) If in exceptional circumstances an industry or a part of an industry sets up a central fund approved by the Board of Trade into which nucleus concerns pay levies and from which compensation is paid to closed concerns, then the amounts paid in by the nucleus concerns (not being payments to be used for capital purposes) will be allowed as deductions in computing their tax liability, provided that there is no residue in the fund, and amounts drawn out by closed concerns will be treated as trading receipts.

(4) In computing liability to Excess Profits Tax the amount of capital represented by machinery and plant which, under a concentration scheme approved by the Board, a closed concern has temporarily ceased to use, will be regarded as still employed in the business.

(5) The deduction allowable for Income Tax purposes for the wear and tear of machinery and plant will continue to be allowed to a concern which has closed as a result of an improved concentration arrangement, but still retains the machinery, and this deduction will be computed as if the machinery and plant were in normal use.

Whose Fault?

(*Continued from page* 339.)

the present war has shown how half-hearted have been some of these attempts; and how small has been the impression made. Had the ironfounders ensured that engineers and other consumers of their products were fully conversant with the present mechanical, physical and other properties of their commodity; and had they indicated some of the applications for which it had been *proved* cast iron was suitable, no doubt they would have been able to play a more active part in war production. Their dilatoriness has necessitated the wastage of time by the present consumer's technical staff. Ironfounders should not, therefore, be disgruntled if the consumer does not always select cast iron for applications where it might possibly be suitable.

A correspondent mentioned in this journal some time ago* that, whilst British ironfounders were not fully engaged, American ironfounders were executing both educational and regular orders for shell and ammunition parts, and said "it seems curious that American exchange should be used in buying iron castings, unless our own productive capacity is fully employed already." It does seem curious; can it be that American ironfounders and ironfoundries are more adaptable than those in this country? Can it be that the American executives responsible for obtaining contracts have worked a little harder, searched a little deeper, than those responsible for the same duties here?

If the ironfoundry industry is to emerge from the war in a position from which it will be able to regain its peacetime activities, steps will have to be taken forthwith to modify the founder's outlook. The Government's schemes for the concentration of industry may well affect the grey iron foundries in the very near future. This is another factor to be borne in mind.

National schemes for industrial reconstruction are, we are assured, being formulated to take effect at the conclusion of hostilities; but this is not to suggest that ironfounders should not help themselves. Wartime requirements have stimulated industries which may, in a certain sense, be regarded as competitive with the ironfoundry industry. These industries (particularly the light alloys and plastics), already highly developed before the war, will in a year or two be in a position to offer even more competition to the ironfounders.

* FOUNDRY TRADE JOURNAL, January 9, 1941, p. 18.

Random Shots

The excellent and sustaining (not sustained mark you) speech given by Sir John Wardlaw-Milne at the recent reunion luncheon at the Dorchester to the London foundrymen was not without its amusing stories. The best of these was of a man who would not take shelter during an air raid. In spite of the vigour of the attack and the repeated shouts of the warden to take cover, he continued to stroll down the street. "Damn it, man," he retaliated, "I help to pay for this blank blank war; can't I even have a look at it?"

* * *

The latest schoolboy story, on the other hand, is of the Middle Form boy who, when asked to compare the word "ill" gave the following answer: "Ill, worse, dead."

* * *

The juniors, not to be outdone, immediately concocted one of their own. A little fellow from Form I, it was said, had gone home crying because the master had trounced him for saying that the plural of penny was tuppence.

* * *

"Give an example of an alloy," said the teacher in a science lesson. "Please, Sir," piped up a little Cockney, "at the moment America seems to be our best alloy."

* * *

Amongst the war charity functions held recently in a provincial town was a musical soirée. More than one famous musician was there to delight the audience with the best from their repertoire. The audience itself consisted of the leading devotees of music in the district, and, unavoidably, just a few who, though not musical, were ready to help any good cause. Amongst these was the local bore, who would chatter too loudly between the items. "Talking of music," said he in accents shrill and clear between a fugue and a concerto; "talking of music," he repeated, "there's a darned good show on at the hippodrome this week!"

* * *

This man, on his way home, confided to a friend that he didn't recognise a note of music except "God Save the King," and only that because the audience always stand up!

* * *

A good "metallurgical" crossword clue comes from the "Times."

Clue: "Not the work of a brassfounder, but perhaps of a founder with brass."

Answer: "Endowment."

* * *

The best cryptic clue of the week, however, appears in the "Sunday Times."

Clue 18: "With 3 gone."

Answer: "Fifteen."

* * *

Many foundrymen have heard the Editor tell the story how during the last war, after a nine hundred miles non-stop journey, he requested an hotel manager to give him a room on the opposite side of the building to the railway station. The result, however, was a restless night owing to the non-arrival of the lions' dinner, there being a menagerie in the fair ground below. British railways may be noisy but surely they must be eclipsed by the Indian variety for a writer in "The Pioneer," an Indian paper, quotes the following grouse received from a man who had the misfortune to live near a large junction:—

"Gentlemen,—Why must your engines ding and dong and bang and fizz and spit and pant and grate and grind and puff and bump and chug and hoot and toot and whistle and wheeze and jar and jerk and snarl and slam and throb and roar and rattle and yell and smell and smoke and shriek and scream all the night long?"

"MARKSMAN."

London Foundrymen's Reunion Luncheon

SIR JOHN WARDLAW-MILNE ON POST-WAR CONDITIONS

To offset the disadvantages of being unable to hold the usual annual dinner during war-time, when foundrymen are playing so vital a part in the war effort, the London Branch of the Institute of British Foundrymen arranged a very pleasant reunion luncheon at the Dorchester Hotel, Park Lane, London, W.1, on Saturday, May 10. The jovial Branch-President, Mr. Barrington Hooper, C.B.E., presided over a gathering which included Mrs. Barrington Hooper, Sir John Wardlaw-Milne, K.B.E., M.P., and Lady Wardlaw-Milne, Mr. W. B. Lake, J.P. (President of the Institute) and Mrs. Lake, Mr. S. Walton, C.B.E., LL.D., M.A., Lieut.-Col. Maitland Makgill Crichton. D.S.O., Mr. V. C. Faulkner (Past-President of the Institute) and Mrs. Faulkner, Mr. Edmond Compton (Ministry of Supply) and a number of Past-Presidents and other prominent members of the Branch.

The function which was primarily social, lasted well into the afternoon. There were some speeches and entertainment, including a rather complicated card trick by Mr. Faulkner which had a happy ending for some of the ladies present, who received gifts of an enamelled spoon, Ronson lighters and chocolates.

The loyal toast was honoured with enthusiasm.

The CHAIRMAN introduced Sir John Wardlaw-Milne, who, in addition to serving the country as chairman of the Select Committee on Government Expenditure, has been very closely concerned with the heavy industries. The chairman recalled that shipbuilding and foundry interests, to a large extent in India, had been part of his daily life, for he was very closely associated with one of the largest concerns in Calcutta and Bombay. During the last war he had taken on the more vigorous task of overcoming the enemy. In view of his wide experience, one could think of no one more capable of trying to save the country's bawbees; and the members of the London Branch were grateful to Sir John and Lady Wardlaw-Milne for having honoured the gathering by their presence.

SIR JOHN WARDLAW-MILNE, K.B.E., M.P., addressed the gathering. Commenting jocularly that the chairman's introductory remarks had made life a little more difficult for him than it had been previously, he said that, except for his present association with certain Indian railways, his connection with foundry work was largely a matter of the past. He did retain, however, vivid recollections of that connection, and he was, therefore, very glad indeed to accept the kind invitation to luncheon with the Institute. It was unfortunate, he added, that Lord Portal had been unable to attend, for reasons of health.

Indicating that he had no intention of discussing on that occasion the problem of national expenditure, Sir John said he could not claim that the chairmanship of the Committee on National Expenditure had been bestowed upon him—"bestowed" was the right word—by reason of the fact that he was a Scotsman. The 32 members of that Committee included Scots, English, Irish and Welsh, and he was not sure which of them had national characteristics to make them best suited to be inquirers into or auditors of public expenditure. It had been said that the British race was a very great race, one of the greatest in the world; and some people had added that our misfortune was that we knew it! It had been said that the Englishman took his beer and his Bible wherever he went; that the Scotsman kept the Sabbath and everything else he could lay his hands on; that the Welshman prayed on his knees on Sunday and on his neighbours during the rest of the week; and that the Irishman did not know what he wanted, but would not be happy until he got it! Those might be some of the characteristics of the curious conglomeration of people who made up the British race; and it was perhaps a good thing that we were that kind of mixture. He did not claim that the Scots alone had the mentality to inquire into the war expenditure of our country at the present time.

Value of Technical Institutes

Emphasising the great value of organisations such as the Institute (now in its 36th year), Sir John commented that we in this country occupied a rather curious position, for whilst we had a reputation for our heavy engineering products, we had never had such a reputation as had some other nations for high precision products of the kind represented, for example, by small foundry products used in connection with navigation and other instruments. This country would have to meet very keen competition after the war, and for that reason alone the work of the Institute was of the greatest value. During the 36 or 37 years of its existence, the Institute had made great strides, and he mentioned as an example the fact that the certificates it issued in respect of technical ability were nationally accepted. After remarking incidentally that the word "foundryman" was new to him, and that he was told that it originated in America, he emphasised that the work of the foundries was the foundation and the backbone of most of our great war effort, and he was very glad to know that a Committee of the Institute was working very closely with the Ministry of Supply in connection with the production of war materials. We in this country could be very proud of much that we had produced during the eighteen months of war; our Hurricanes and Spitfires and other products of this country were the admiration of the world, and we had not fallen behind other countries. Nevertheless, we had a very long and difficult road to travel, and every bit of scientific knowledge and application that we could make use of would be essential to our winning the war. It was because he felt that the Institute was of such great value in that connection that he emphasised that at the moment it must be regarded from the point of view of war production. It would also be of immense value after the war, when we should have to meet very grave competition of the kind which would make it necessary for us to widen to some extent our boundaries and not be satisfied with such conditions as had enabled British industry to prosper in the past, and, secondly, when the world would require new kinds of products altogether. It was all to the good that the Institute had done a good deal abroad, by participating in international conferences such as those held in Paris, Rome and Warsaw, and organising the one held in London just before the war, in connection with which the Institute owed so much to Mr. Lake, Mr. Barrington Hooper and others of the London Branch.

The Post-War World

Often he had wondered whether we appreciated fully how entirely different the world would be after the war as compared with the pre-war conditions. Already conditions were different for most employers in this country. Part of the old régime had gone, and rightly so, and there had arisen new difficulties connected with labour and trade, such as that of upgrading and dilution, the employment of women in industry, and so on. Further, unless we were careful we might lose a great deal of initiative by reason of the mere fact that the profit of industry was for the time being taken out of it; that was bound to have a very serious effect upon the workmen, who had difficulties, such as much longer hours of work and the sacrifice of many trades' union and other rights which they had enjoyed in peacetime. Such factors would make things very difficult after the war if we did not see ahead and try to meet the post-war conditions.

At first sight one might conclude that after the war there would be more or less slave conditions in Europe; that we in this country would have to compete against countries in which people would probably be paid almost starvation wages. He was not, however, worried so much about that competition as were many people, for many did not realise what a completely changed world it would be. Science had changed everything during the last few years, and nowhere had science advanced more than in the foundry industry. Assuming universal peace—and if we were not to achieve it there was no object in fighting—science had produced a state of affairs in which human beings need not labour for more than half the time their forefathers had laboured, and yet could earn what they required for their existence and most of what they required for luxuries.

Industrial Mobilisation only 70 per cent.

Yet, however much we tried to think ahead, we must not allow those thoughts to divert us from the primary purposes of winning the war. The winning of the war involved not merely the production of all the necessary goods and machinery but also the maintenance of the morale of the people. A country might be defeated, but not its people; he believed that that would be appreciated in some of the countries of Europe before long, also so long as the people were not defeated, their country could not be defeated. As one who had to visit industrial areas in this country frequently, he felt that our people were only about 70 per cent. in the war to-day, for they had not all appreciated what the war meant; and unless they really appreciated what it meant we should not win it. They must realise that their whole existence and their future depended on winning—and he had no doubt that we should win. The people were not antagonistic; in many cases they lacked realisation. Their spirit was marvellous, and our opponents never could realise that they could never break it. He was most anxious to impress upon all the necessity for putting 100 per cent. of effort into the war and getting it finished, for we *could* bring about universal peace. Great Britain and America would have to police the world for some time after the war, but eventually the peace must be maintained by international co-operation combined with such restrictions as would make war impossible. Our aim was to offer freedom of thought and speech and to end fear, and he hoped that we should not forget that after we had won the war.

When peace came, the Institute would have the chance again to promote international co-operation, giving us the place he wished to see us occupy, not only in respect of the heavy industries but also the light industries, and helping to secure co-operation between employers and employed both here and abroad. In the knowledge that that would be achieved, Sir John proposed a toast to the Institute.

The CHAIRMAN, conveying the thanks of the Branch to its distinguished guest, said that Sir John was tackling a real man's job; like St.

George, he had a dragon to kill, the dragon of waste, which was gnawing our vitals and dragging us downhill. Having seen and heard Sir John, they knew there was nothing to fear, for the end of the dragon was already in sight. Let them take off their hats to the superman who was trying to keep a check on those who were spending our cash at the rate of ten millions a day. Knowing how thorough he was at his job, it was easy to comprehend his wish to meet foundrymen, who provided their quota of the money to spend! If the foundrymen, of whom the gathering was representative, should cease to function, the whole of the world's machinery would stop. The very word "foundry" meant "basis" or "beginning," and it applied most aptly to the industry on which civilisation so utterly relied.

The chairman went on to pay a sincere tribute to, and invited foundrymen present to record their thanks, their regard and their sincere appreciation, to Mr. W. B. Lake, the President of the Institute. (Applause.) No one, he said, had done more for the Institute than had Mr. Lake, and the members wished to add their thanks also to his gracious and charming wife. (Renewed applause.)

The chairman took the opportunity also to mention the debt which the Branch owed to Mr. Lockwood, the Vice-President of the London Branch, who had mothered the Branch for some years as its Hon. Secretary; to Mr. John Bolton, who had taken over a very difficult job from Mr. Tom Makemson, the General Secretary of the Institute (now serving the Government); and to such as Mr. V. C. Faulkner, Mr. V. Delport, Mr. C. H. Kain, Mr. G. C. Pierce and others who had rendered yeoman service as Presidents of the Branch.

In a final word of thanks to Sir John Wardlaw-Milne, he said Sir John had by his presence and his remarks given the foundrymen present inspiration to carry on with renewed determination their task of winning the war. They were helping to beat the enemy, and were proud to have helped to make the aeroplanes which were used by our young airmen to win the Battle of Britain.

What the Institute is Doing

MR. W. B. LAKE (President of the Institute) proposed the health of the guests, and took the opportunity to refer to some of the work of the Institute, and of the London Branch in particular. The Institute as a whole, he said, was progressing very well indeed. It was not doing quite the amount of work that it had been able to do in the past, but it was aiding the national effort considerably in many ways. Most of its members were engaged directly on Government work, and various of the Committees had assisted the Government on particular aspects of that work. For example, the Institute's Technical Committee had a very important job in assisting the Iron and Steel Control to establish a number of new foundries. In that connection he recalled that on one occasion, when the Ministry of Supply had required information on a particular technical subject, the Institute's Technical Committee had been able, within 24 hours, to get together from among its members the leading experts on that subject, and they had settled the matter in a couple of hours or so. That was but one example of the really good work the Institute was doing.

Speaking of the London Branch, for which he had so great an affection and to which he owed so much, Mr. Lake said that during the two years in which he had had the honour of being its President he had been given all the assistance it was possible to give; and it was to the London Branch that he owed his nomination as President of the Institute. It was, therefore, a particular pleasure to attend the luncheon and to meet so many old friends. In a tribute to the Branch-President, he said he knew from experience how difficult it was to carry on the Branch-Presidency for two years in succession; yet Mr. Barrington Hooper was carrying on with undiminished enthusiasm. The Branch was indeed fortunate in having secured his continued service. (Applause.)

As the occasion was his last opportunity of speaking as President of the Institute, Mr. Lake expressed his gratitude to the London Branch for the support it had always accorded him.

Among the guests, to all of whom he offered a cordial welcome, he mentioned specifically Sir John and Lady Wardlaw-Milne, Lieut.-Colonel Maitland Makgill Crichton, D.S.O., and Mrs. Portway, whose husband, Colonel Portway, has been President of the East Anglian Section and is now on active service. It was particularly pleasing to welcome Mrs. Portway, whose presence indicated her own interest in and her husband's close association with the Institute.

Coupling with the toast the name of Mr. Faulkner, who was to respond, Mr. Lake said it was difficult to regard him as a guest, because for many years he had done enormous work, as Hon. Secretary, in getting the Branch into working order and might almost be regarded as one of the fathers of the Branch. Subsequently he had served as Branch-President and as President of the Institute; and again to-day, when so many had been called to the Colours or transferred to other posts, he had assumed the duties of Hon. Branch Secretary. Thus, the Branch owed him its deepest thanks. (Applause.)

Secretary's Response

MR. FAULKNER, in his response, said that he, too, found it difficult to regard himself as a guest, for he had been a member of the Institute for about thirty years and his life had been intimately interwoven with that of the Institute. He recalled that he had been nominated by Dr. Swinden, and said that his first subscription was the best-spent half-guinea within his recollection.

Owing to the fact that he had spent four years abroad, he had not been able to participate very much in the Institute's affairs during the last war period. On being transferred to London, however, he had attended a meeting there at which there was discussed a resolution to the effect that the London Branch be wound up, owing to lack of interest. There were present at that meeting men such as Mr. Wesley Lambert, Mr. G. C. Pierce, Mr. H. O. Slater and others forming a nucleus who could be relied upon to build up a really good organisation. The Branch membership at that time was about 75, and he had accepted the post of Hon. Secretary of the Branch. His period of service in that capacity was the happiest of his life, for he had known every one of the members personally and had secured their co-operation. From those small beginnings the Branch had become the largest in the Institute.

Some of the members had achieved deserved eminence, and there were others whose eminence had not yet been adequately recognised. He had been particularly pleased to read in the Press that one of the members, Mr. A. H. Moore, of South Africa, had contributed £5,000 out of his own pocket for the purchase of a Spitfire. (Applause.) Mr. Moore, who was once a journeyman moulder, with Mr. C. E. Williams, a past-president of the Institute, had achieved a very high position in South Africa. As showing the progress that was being made by the industry in South Africa, he said he had read recently of a new foundry, established there since the war, with a minimum of 13 baby Bessemers. South Africa was building up a tremendous metallurgical industry, as Canada had done during the last war.

Continuing, he said that Great Britain possessed a lot of fundamental knowledge and the ability to produce specialities which it would be able to produce to very good purpose for the South African and other Dominions' steel industries. In his opinion the smaller countries of the world would not be able to produce materials using mass production methods; after the war this country must develop industry on quantity-production lines and export its products all over the world. The indomitable spirit of the British would ensure a good future. Finally, Mr. Faulkner said he was enjoying his duties as Hon. Secretary of the London Branch of the Institute. He was able to meet the members on a new and more interesting footing and to help them in many ways.

Testing of Welds

The testing of welds by cold-rolling was the subject of a Paper presented to the American Welding Society by T. P. HUGHES and R. L. DOWDELL. According to a brief report in "Heat Treating and Forging," the authors do not intend that the cold-rolling of weld joints should supplant the already existing tests; nevertheless they are of the opinion that a method of testing such as they propose will add to the existing tests, means of determining desirable joint properties. The cold-rolling test, they state, is a more drastic test of the ductility of weld metal and the base metal in the heat-affected areas adjacent to the weld than any of those now used. It measures qualitatively any internal or so-called "locked-up" stresses in the immediate vicinity of the weld. And when external stresses, such as produced by cold-rolling, are added to the existing internal stresses this method of testing causes rupture in a relatively short time, even on a single pass of 0.010 in.

This study concerned itself with the cold-rolling properties of welded joints in steel plates of desirable weldability. All plates were of mild steel. One-half of all tests pieces were obtained from plates which had been welded under approved conditions, and special care had been exercised in avoiding any unfused zones, cracks or porosity. The other half of the coupons were cut from plates in which unfused areas had been left. In order further to simulate industrial practices one group of test pieces of both types was stress relieved at 650 deg. C. for one hour; the other group was tested in the "as received" condition.

The procedure of testing consisted in rolling the coupons, ½ in. strips, transverse to the weld by passing them through a set of hardened two-high rolls. In earlier work it had been found that a reduction per pass of 0.010 in. produced rupture in poor welds in less time than heavier reductions at 0.030 or 0.040 in., so the lighter reduction was maintained throughout. All overlays were rough-ground flush before cold-rolling. The test pieces preparatory to rolling had been ground to ½ in. by ½ in., and were 4 in. long.

Results showed that mild-steel plates or sheet, ½ in. thick, properly welded can be reduced by cold rolling.

Results showed that strips of ½-in. plate, when properly welded, could be cold-rolled to strip of about 0.070 in., while plate with unfused lip lines could be cold reduced only one pass, or 0.010 in., before revealing the unfused portion.

World's Largest Steel Freight Car

Claimed to be the world's largest freight car, a 90-ft., 157-ton "well" type car has been delivered to the Carnegie-Illinois Steel Corporation. This car, which is more than twice the length of ordinary freight cars, will be used for inter-plant transportation of large ingot moulds ranging up to 160 tons each, and for other purposes. Upwards of 200 tons of steel can be bottom-poured into each of these huge moulds. The new car is of welded plate and structural construction, and has a load capacity of 235 tons. Its light weight is 140 tons and the combined rail weight of 840,000 lbs., as compared with the 56 tons rail load of the average freight car now in use. The car was built so that the tremendous weight is distributed within permissible axle load limits.

The Polishing of Cast-Iron Micro-Specimens and the Metallography of Graphite Flakes

By H. MORROGH

(*Continued from page* 329.)

When such a flake (Fig. 18) is examined under polarised light between crossed nicols, on rotation of the specimen through 360 deg. it lights up four times; this is expected from the hexagonal anisotropy of graphite (Figs. 16 and 17). The actual position of lighting up varies slightly according to the orientation of the graphite flake in relation to the surface of the specimen. However, if the cross lines in Fig. 16 represent the planes of polarisation of the analyser and polariser, then the position of the graphite flake shown is one of the positions of brightness.

The only graphite flakes to show this "ideal" behaviour under polarised light are generally the short, straight ones. Curved flakes show structural complications.

Secondary graphite, that is hypereutectoid and eutectoid graphite, is generally deposited on the existing graphite flakes in the form of a smooth band, which is similarly oriented to the main body and is therefore difficult to show. A band of such secondary graphite is seen in Fig. 19.

Sometimes the secondary graphite is deposited on the graphite lamellæ in an irregular manner, so that the edges have a "fluffy" appearance (Figs. 20 and 21). At high magnifications, it appears that this fluffy secondary graphite is arranged in a Widmanstätten formation (Fig. 22). In fact, in rare cases, a well-developed Widmanstätten structure is obtained. This is shown in Figs. 23 and 24. The reason for the formation of the graphite Widmanstätten structure may seem obscure at first sight, but while in certain respects its formation is unique, the explanation may be very simple. When a solid solution stable at high temperatures precipitates a new phase over a range of temperature on casting, then the new phase may be deposited in one of several ways. For instance, it may be deposited at the grain boundaries of the parent solid solution, or it may be deposited in such a way that its lattice bears a definite crystallographic relation to the lattice of the parent solid

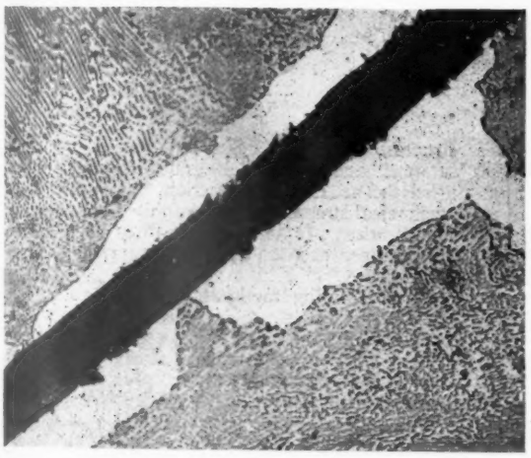


FIG. 19.—INGOT MOULD SECTION; GRAPHITE FLAKE SURROUNDED BY FERRITE AND PEARLITE. × 1,000.

FIG. 20.—COMMON IRON; "FLUFFY" APPEARANCE OF SECONDARY GRAPHITE. ETCHED IN PICRIC ACID. × 200.

FIG. 21.—SAME AS FIG. 20 AT HIGHER MAGNIFICATION. × 500.

FIG. 22.—SAME SAMPLE AS FIGS. 20 AND 21 AT HIGHER MAGNIFICATION. SECONDARY GRAPHITE, WHICH APPEARED "FLUFFY" AT LOWER POWERS, SEEN TO BE ARRANGED IN WIDMANSTATTEN FORMATION. × 4,000.

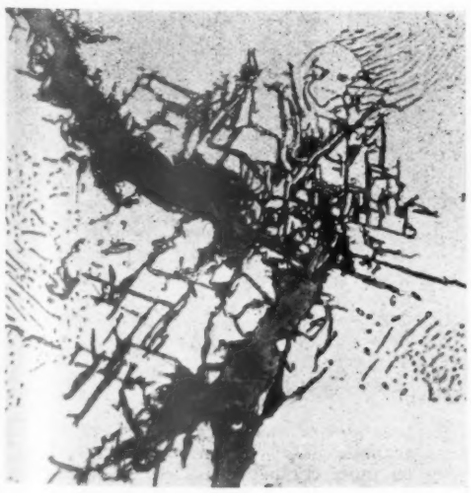


FIG. 23.—WELL-DEVELOPED WIDMANSTATTEN STRUCTURE IN HOT-MOULD IRON; SECONDARY GRAPHITE OBVIOUSLY ATTACHED TO FLAKE GRAPHITE. MATRIX, FERRITE WITH SMALL AMOUNT OF PEARLITE. × 1,000.

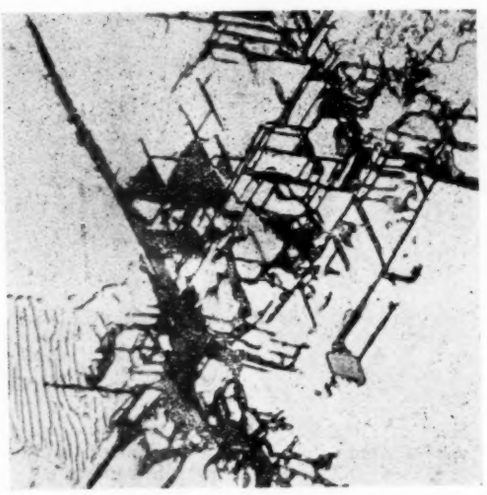


FIG. 24.—SAME SPECIMEN AS FIG. 23. GRAPHITE FLAKE APPARENTLY OUT OF THE PLANE OF THE SURFACE OF THE SPECIMEN. × 1,000.

FIG. 25.—SMALL CRYSTAL OF SECONDARY GRAPHITE. ORDINARY VERTICAL ILLUMINATION. × 750.

FIG. 26.—SAME AS FIG, 25 WITH CROSSED NICOLS. × 750.

solution, that is, it forms a Widmanstätten structure. Further, if the phase which is being precipitated from the solid solution already exists in the structure, then it may be deposited on the already existing areas of this phase. A typical example of the latter mode is the deposition of the new phase is an alternative to both the grain boundary type of deposition and the deposition on the already existing phase. Of course, when there is an already existing phase, then deposition of the phase from the solid solution may occur in three different ways—it may be deposited on the already existing phase, it may be deposited at the grain boundaries of the parent solid solution, or it may be deposited in a Widmanstätten structure in that solid solution. The simultaneous deposition of hypereutectoid cementite in all these three ways has, in fact, been observed in certain low-carbon, hypoeutectic white irons. When the new phase is being deposited from a solid solution with no other phases in the structure, then a controlled rate of cooling, neither extremely fast nor extremely slow, and a large grain size are the conditions favourable for the development of a well-defined Widmanstätten structure. Now, the graphite Widmanstätten structure shown here consists of hypereutectoid graphite, which has been deposited from the austenite. It may be said that the normal mode of deposition of this hypereutectoid graphite is in the form of a smooth band on the already existing eutectic flake graphite. From these points it is seen that the grain size of the original austenite does not vitally determine whether the graphite will be deposited normally or in the Widmanstätten form, and the conditions favourable for the development of the graphite Widmanstätten pattern are a controlled rate of cooling, neither extremely slow nor extremely fast, and a eutectic graphite structure consisting of a few very coarse flakes. The latter condition is most easily met in low-carbon irons of large section. The actual rate of cooling required to produce the graphite Widmanstätten pattern must be very critical, as this structure is seen in a fully developed form only very rarely.

Hanemann and Schrader have shown that secondary graphite sometimes forms small needle-like crystals of different orientation from the graphite flake. An example of this is shown in Fig. 25. The arrow points to a small crystal of secondary graphite, and it is seen to have a different orientation from the flake, since it is light while the flake is dark. Fig. 26 shows the same spot taken between crossed nicols; the flake is black and the secondary graphite has lit up.

At high magnifications, a series of needles differently coloured, and hence differently oriented from the rest of the graphite is apparent. Typical examples of these needle like formations are shown in Figs. 27, 28, 29 and 30. This effect is most marked near to and at bends in graphite flakes. If the flake is in its dark position, then the needles appear bright, and if the flake is in its bright position, the needles appear dark. Vilella observed a microstructure in graphite flakes of carefully prepared samples, and Hanemann and Schrader recognised the needle-like formation, attributing it to mechanical stressing of the graphite flakes during solidification. In the simplest cases the needles are arranged end to end, but at an angle to one another.

By heat-tinting methods, it has been found possible to indicate the presence of both the secondary graphite and the needle formations in the graphite flake, and it is interesting to observe that this formation is confined almost entirely to the "primary" graphite flake and is usually not present in the secondary graphite (Fig. 31).

Frequently, and more particularly in very large graphite flakes, the needle-like structure takes on more complicated forms. In this respect the micrographs in Fig. 32(*a*, *b*, *c*) are interesting. They illustrate a flake of kish graphite in a piece of dead-annealed pig-iron. Fig. 32(*a*) shows the main body of the graphite in its bright pleochroic position; in this case the needles are dark. Fig. 32(*b*) depicts the same

FIG. 27.—NEEDLE FORMATION IN GRAPHITE FLAKE IN INGOT MOULD SPECIMEN. FLAKE IN ITS DARK POSITION. ETCHED IN PICRIC ACID. × 2,000.

FIG. 28.—SAME AS FIG. 27 BETWEEN CROSSED NICOLS. × 2,000.

FIG. 29.—SIMPLE SET OF NEEDLES IN A GRAPHITE FLAKE. UNETCHED. × 2,000.

FIG. 30.—SAME AS FIG. 29 BETWEEN CROSSED NICOLS. × 2,000.

FIG. 31. — 100-TON ANVIL BLOCK SECTION; HEAT-TINTED. NEEDLES CONFINED TO "PRIMARY" GRAPHITE FLAKE AND NOT PRESENT IN SECONDARY GRAPHITE. × 1,000.

(*a*) Flake in bright pleochroic position; needles dark.

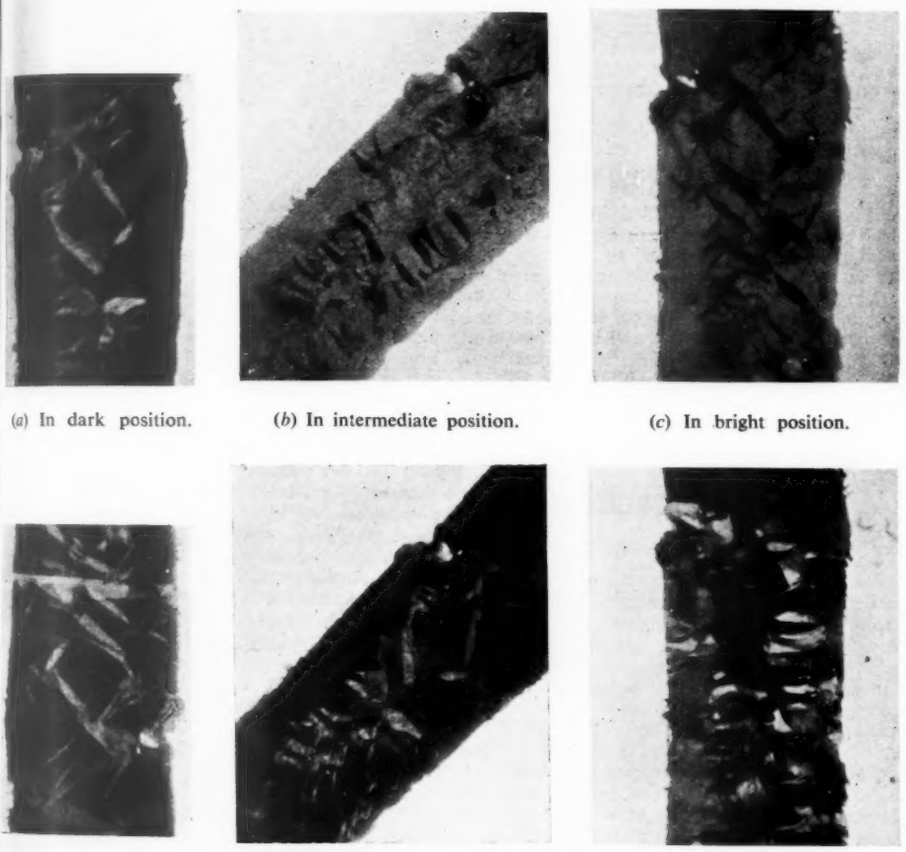
(*b*) Flake in intermediate pleochroic position; needles formerly dark now bright.

(*c*) Flake in dark position.

FIG. 32.—FLAKE OF KISH GRAPHITE. UNETCHED. × 2,000.

spot with the flake in the intermediate pleochroic position; the needles are now bright. Fig. 32(*c*) illustrates the same idea with the main body of the graphite flake in its position of maximum pleochroic absorption. It is seen in Fig. 32(*a*) that the flake is made up of five bands and that the large system of needles is confined to the centre band, which is presumably the primary graphite crystal. The two bands on either side of the centre appear to have been deposited in the manner of secondary graphite; the extreme outer bands are probably eutectoid graphite produced by the annealing treatment, and the intermediate bands are probably hypereutectoid or even eutectic graphite. The intermediate band in the lower part of the flake in Fig. 32(*c*) is seen to contain a series of needles. If Hanemann and Schrader's assumption be correct, then it seems that some mechanical stressing occurred after the deposition of this band. It is interesting to note that a rotation of 90 deg. introduces a complete reversal of pleochroic contrasts between the main body of the flake and the needle formations.

In some graphite flakes, the simple end-to-end needle formation is not apparent (Fig. 33 (*a, b, c*)), the whole of the graphite flake being a conglomerate of small needle-like crystals of graphite with various orientations, this being particularly obvious when the specimen is viewed under polarised light with the nicols at 45 deg. (Fig. 33(*d, e, f*)).



(*a*) In dark position. (*b*) In intermediate position. (*c*) In bright position.

(*d*) Same as (*a*) with nicols at 45 deg. (*e*) Same as (*b*) with nicols at 45 deg. (*f*) Same as (*c*) with nicols at 45 deg.

FIG. 33.—FLAKE OF KISH GRAPHITE. NEEDLE FORMATION NOT OF THE SIMPLE TYPE SHOWN IN FIG. 32. UNETCHED. × 2,000.

Non-Metallic Inclusions

The effect of non-metallic inclusions on the structure of grey cast iron is a much-debated topic. While there is little direct microscopical evidence of inoculation or nucleation of melts by inclusions, it is significant to note that they do occur attached to and perhaps inside graphite flakes. Both titanium cyano-nitride and manganese sulphide crystals are frequently observed attached or adjacent to the ends of graphite flakes. A typical example of a manganese sulphide crystal attached to the end of a graphite flake is illustrated in Fig. 34.

Dove-grey, apparently allotriomorphic inclusions, which appear to be manganese sulphide, have been found very intimately associated with graphite in the top of a large ingot mould. This is illustrated in Figs. 35 and 36. Fig. 36 shows the sulphide to be actually inside the graphite flake; this may, of course, be only an accident caused by the position of the surface of the specimen in relation to the flake which makes the inclusion have the appearance of being inside the graphite. It is also possible that the occurrence of the sulphide so intimately associated with graphite has something to do with the flotation of the sulphide to the top of the ingot mould during solidification, where it became enmeshed with the growing eutectic flake graphite.

Temper Carbon

Using the repeated etching and polishing process, it has been possible to observe the internal structure of temper carbon nodules in malleable cast iron. The structure of the temper carbon nodules has been dealt with in the author's Paper on "The Metallography of Inclusions in Cast Irons and Pig-irons" from the point of view of the effect of iron and manganese sulphide on the type of temper carbon formed. In malleable irons containing iron sulphide—for instance, white-heart malleable irons—the temper carbon is in a spherulitic form. The basal planes of the graphite crystals composing the temper carbon nodule are at right angles to the radii of the spheroid of which the nodule can be considered to be composed. It has been possible to show crystals of iron sulphide in the centre of some spherulitic temper-carbon nodules as though providing nuclei for the temper-carbon formation. In malleable irons which contain all the sulphur in the form of manganese sulphide, the temper carbon appears to be an aggregate of

(*Continued on page* 348.)

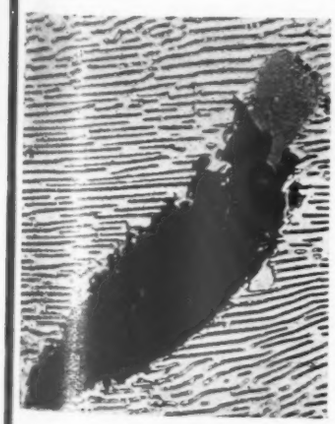


FIG. 34.—GRAPHITE AND MANGANESE SULPHIDE IN MATRIX OF PEARLITE. ETCHED IN PICRIC ACID. × 1,000.

FIG. 35.—GRAPHITE FLAKE IN INGOT MOULD; INCLUSION ATTACHED TO THE SIDE. ETCHED IN PICRIC ACID. × 1,000.

FIG. 36.—SAME SPECIMEN AS FIG. 35. INCLUSIONS APPARENTLY IN THE CENTRE OF A GRAPHITE FLAKE. ETCHED IN PICRIC ACID. × 1,000.

Metal Patterns for the Foundry*

By E. HOLLAND

In this age of precision castings, too much stress cannot be placed on the accuracy, durability and finish of patterns. With these facts evident, it would be relevant to discuss first of all the merits and demerits of wood and metal patterns. The points that must be taken into consideration are the quantity of castings required; number of patterns required to cope with this; method of moulding; first cost of pattern equipment, and cost of upkeep of this equipment.

These points cannot be taken separately, as they each have a bearing upon the final decision, as to whether the patterns shall be wood or metal.

If the quantity of castings required be small and only one pattern is necessary, then at first glance wood suggests itself, but it must be borne in mind that, if the design be of a fragile nature or if without excessive lagging, the pattern will warp, then wood may not be suitable. Any job of a fragile nature is usually cheaper in the long run as a metal pattern, as the cost of upkeep of wood patterns often far exceeds their first cost.

Quite often what might be termed metal inlaid wood patterns are encountered. These carry metal ribs, and wearing strips are inlaid or built into the pattern and corebox. These are no doubt very good when wear on patterns is excessive, or where protruding ribs and brackets would be too fragile in wood. The time factor, however, must not be lost sight of, as the inlaying of these portions may far exceed the cost of an all-metal pattern.

In general, where more than one pattern is required, or where production moulding such as by Sandslinger, jar ramming, or jolt squeeze, where most of the labour is usually only semi-skilled, metal patterns are definitely superior.

Master Patterns

Having decided on metal patterns, the first thing to be made is usually a master pattern executed in soft wood, with as little lagging as possible and carrying but few fillets, etc., the patterns being only puttied or waxed. These master patterns are not always essential, as many patterns can be built up in white metal and lead with almost the same ease as in wood. Many core matrices can be machined and built up in metal with more certainty of durability. A plaster box can be made from this and metal ones then cast.

One source of inconvenience in the metal shop is that the wood patternmaker will persist in assembling all the ribs, brackets and bosses even to the extent of making plate patterns all in one, necessitating the plate having to be machined and filed to pass the pattern right through. Many of these jobs can be simplified if they are made in parts so that the metal patternmaker can machine wherever possible. The leaving-off of one boss will often make all the difference between easy and awkward machining.

Where cores are used to eliminate drawbacks, or to prevent dropped joints on plate work, they can be considerably improved if the pattern portion of the corebox be made loose, dowelled and prepared on the pattern with the prints left off.

The print can be made loose and bedded into the corebox; the loose pattern piece would then be fitted into the corebox, this being dowelled from the loose piece. The print would be drilled from the box, using this as a drilling gauge, finally fastening the loose print on to the pattern and the loose piece on to the corebox.

There is always a certain amount of controversy as to whether it is better to machine or hand-work metal patterns. A machined pattern is the most accurate, and with a little ingenuity almost every job can be machined. By this, it is not meant that every job should be machined, but there are many cases where maximum and minimum thicknesses between pattern and corebox cannot be accurately maintained without making numerous templates or else by machining.

Invariably templates, except for radius gauges, are not necessary when machining patterns, the various shapes being obtained by finding the degrees of the angles and setting on the machine. By this means, time spent on setting up the job is saved in not having to make templates.

Materials Used

Although it is not intended in this Paper to touch on the various mixtures or alloys for metal patterns, it would not be complete without some reference to metals for patterns and coreboxes. Experience has shown that aluminium and brass coreboxes have not a great life owing to the abrasive action of sea sand, particularly on the joint faces. Cast iron, while taking longer to prepare, will usually pay for itself on large orders. Moulding sand has not the same abrasive action on patterns, so where hand drawing of the patterns is used, particularly in plate work, lightness is an advantage and so aluminium alloy is usually preferred.

Sprays of patterns stand up to the heavier usage in brass but have the disadvantage of weight, and while aluminium patterns can be soldered to spray runners quite successfully it is certainly easier in brass. Iron patterns take much longer to prepare and cannot be easily soldered and repaired. These definitely make good long service patterns and are ideal where mechanical lift is used.

It does sometimes occur that one or more extra patterns are wanted for urgent orders. In this case non-contracting metal patterns moulded off the existing pattern will often meet the situation. The chief disadvantages of this metal are that it is heavy and easily bruised.

Having now studied the pattern from all angles, it is germane to ask what about the man who is going to make the job? His characteristics are worth studying, as they have a profound effect on the pattern costs. If a job is given to one man he will probably do it twice as quickly as another man, not because of any greater skill, but because this particular type of job suits him.

One man develops a flair for, say, turning jobs, another makes the miller his pet, while there are some who are artists with a soldering iron. If the work is planned to suit these individuals one gets quicker results.

* An entry submitted to a competition organised by the East Midlands Branch of the Institute of British Foundrymen. The winning entry to the competition: "The Outline of Cupola Control," by C. A. Payne, was published in last week's issue. It was then erroneously stated that five papers were presented. This should have been four, and did not include the paper by W. McConnachie mentioned last week.

Reinforced Cast Iron and its Applications*

By N. LEVANOV.

The supporting capacity of cast iron members may be increased by incorporating in them during casting a reinforcement of mild steel bars. Experimental work has shown that the mild steel should have a carbon content of 0.10 to 0.25 per cent., and should have a perfectly clean surface, free from rust, scale or other contamination. The iron should be poured at a temperature of 1,250 to 1,380 deg. C. Metallographical examination shows that the diffusion of carbon from the cast iron into the steel produces in the latter a surface cementation layer, underlying which is a pearlite zone, while in the central portion the original ferrite + pearlite structure remains unaltered. In the cast iron zone immediately adjacent the steel reinforcement, the structure is that of a eutectoid steel. This is followed by a zone having a sorbitic structure, while further away from the reinforcement there is evidence of a reduction in size of the graphite flakes.

Under tensile stress, the behaviour of reinforced cast iron has a twofold character. During the first stage, as the stress increases, the cast iron and the reinforcement take up the load jointly as a homogeneous material. When the applied stress attains a certain value, the cast iron fractures and thereafter the stress is taken up by the reinforcement alone. Thus, reinforced cast iron supporting members, after the appearance of cracks in the tensioned zone of the cast iron, do not lose their load supporting capacity, but when the whole of the tensile stress is taken up by the reinforcement in the second stage, and the compressive stress is absorbed in the compressed zone of the cast iron, such supporting members are able to carry up to between 80 and 100 per cent. of the maximum load which produced the first cracks in the tensioned portions of the cast iron. Due to the difference in the shrinkage of the cast iron and steel reinforcement, the latter is in a prestressed condition in the final casting, which raises the yield point relatively to the initial condition. Similarly, the cast iron zones subject to tensile stress by an external load are in a precompressed state, and this, coupled with the refining influence of the reinforcement on the structure of the cast iron, increases the supporting capacity of the tensioned zones of the cast iron by a factor of 1.5 to 1.7 as compared with the same cast iron, unreinforced.

In metallurgical constructions, where high durability under severe temperature conditions is required, reinforced cast iron has been found to be eminently suitable. Examples are the sole plates, lining plates and cooling frames of open-hearth furnaces, and the charging bells and supporting rings of blast furnaces. In structural engineering, reinforced cast iron has been successfully employed for the lining sections of the Moscow underground railway. Under test, these sections of reinforced cast iron were found to have a supporting capacity 40 per cent. greater than that of similar sections of cast iron without reinforcement.

* Extracted from the translation of an article appearing in "Vyestnik Metallopromyshlennosti," No. 12, 1939, pp. 11–18 (a Russian Metallurgical Magazine).

Higher Prices for Rainwater Goods

The Ministry of Supply have issued a Direction (Direction No. 3) under the Control of Iron and Steel (No. 8) Order, 1940, dealing with iron castings. Under paragraph 1 of the Direction, maximum prices for iron castings in the form of rainwater and soil goods, gutters and connections, i.e., what is usually known as builders' ironwork, are increased to 21 per cent. above the basis prices in the deposited Schedules; an increase of 2½ per cent. on those basis prices as compared with the prices previously ruling. This increase is based on increases in the cost of wages and fuel. Paragraph 2 of the Direction restricts to half a hundredweight, or £10 in value, the maximum quantity of iron castings which any person may buy without licence in any week. The previous limit was 5 cwt., or £10, and this further restriction arises from the necessity of conserving supplies of iron. Copies of this Direction may be obtained from H.M. Stationery Office, York House, Kingsway, W.C.2. (Price 1d.)

Aluminium Castings for Aircraft

THE TYPES, PROPERTIES AND USES OF COMMERCIAL SAND CASTING ALLOYS EMPLOYED IN AIRCRAFT STRUCTURES

By NORMAN E. WOLDMAN, Ph.D.

(*Continued from page* 262.)

Many of the sand-cast aluminium alloys can be successfully cast in permanent moulds, but in other cases special alloys have been developed for this purpose. Permanent mould castings have the advantage over sand castings in greater strength and ductility, more exact size and better surface. They also have lower cost of production, when the quantity is sufficiently great to discount the initial cost of the mould. They are thus the most metallurgically desirable type of aluminium alloy castings. Permanent mould castings are used where a superior product is required, or when a forging cannot be used, either because of the form of the part or because of cost considerations. The strength of a casting produced from a given alloy in a permanent mould is about 20 per cent. greater than that obtained from a sand casting, and the hardness and ductility are correspondingly greater. The dimensions may be controlled more accurately than in a sand mould casting, and either a machined or polished surface will generally show greater freedom from porosity. By the use of permanent mould castings, it is often possible to effect appreciable saving in weight due to the ability to design to closer limits.

In addition to superior mechanical properties possessed by permanent mould castings, the alloys have greater resistance to corrosion and greater susceptibility to heat-treatment where this process is applicable, due to the fine grain and greater density of the metal.

The moulds should be made of close-grained, low-phosphorus grey cast iron. The less complicated cores for permanent moulds can be advantageously made of high-speed steel. For complicated cores, dry sand can be used, and the moulds are then known as "semi-permanent." When casting in permanent moulds, it is necessary that the moulds should be hot. If castings are made in cold moulds, they are usually found to be cracked and are, therefore, useless. The best results are usually obtained at temperatures of about 400 deg. C. The metal is poured into the mould by gravity feed. Although the mould is hot, the molten metal is chilled rapidly and the casting is dumped out while still at high temperature. That is, when metal cores are employed, it is necessary to withdraw them just as soon as the casting has set sufficiently, and before solidification shrinkage is complete, otherwise cracks are likely to occur in the casting because of the hot-shortness of practically all aluminium casting alloys. The moulds are poured so that the portion of the casting farthest from the gate solidifies first; this allows the casting to be fed as the metal sets and thus prevents the formation of shrinkage cavities.

Permanent mould castings, depending on size and design, can be cast with $\frac{3}{32}$-in. minimum wall thickness. The overall dimensions can usually be held to ± 0.010 in. Usually $\frac{1}{32}$ in. is allowed for machining.

The well-known aircraft permanent mould castings are:—Alcoa 43, Alcoa A108, Alcoa 122, Alcoa A132, Alcoa 142, Alcoa B195, Alcoa 355, and their A.S.T.M. or S.A.E. equivalents. Other manufacturers use their own trade names for these alloys.

The composition, properties and commercial equivalents of various permanent mould aluminium casting alloys are shown in Table V. The uses and characteristics of these alloys are listed below:—

Alcoa 43.—See information under sand castings.

*Alcoa A*108.—Combines desirable characteristics of both the silicon-aluminium and the copper-aluminium alloys.

TABLE V.—*Composition, Properties and Commercial Equivalents of Permanent Mould Casting Alloys.*

Composition (typical):

	Cu	Si	Fe	Mg	Ni	Al
Alcoa 43	—	5.0	—	—	—	Balance.
Alcoa A108	4.5	5.5	—	—	—	Balance.
Alcoa 122	10.0	—	1.2	0.2	—	Balance.
Alcoa A132	0.8	12.0	0.8	1.0	2.5	Balance.
Alcoa 142	4.0	—	—	1.5	2.0	Balance.
Alcoa B195	4.5	2.8	—	—	—	Balance.
Alcoa 355	1.2	5.0	—	0.5	—	Balance.

Properties (typical):

Alcoa.	M.S. Tons per sq. in.	Elongation. Per cent.	Brinell hardness.
43	9.4	2.5	40
A108	10.7	0.5	70
122-T52	13.4	0.0	105
122-T65	17.9	0.0	140
A132-T4	15.2	1.0	100
A132-T551	13.8	0.0	105
142-T61	17.9	0.0	110
142-T571	15.2	0.0	105
B195-T4	14.7	4.5	75
B195-T6	15.6	2.0	90
355-T6	16.5	1.5	95

NOTE.—Data taken from Aluminum Co. of America publications.

Alcoa 122.—Brake shoes, bearings caps, pistons, camshaft bearings, where high hardness and good bearing properties are required.

*Alcoa A*132.—Has lowest coefficient of expansion and lowest weight. Possesses excellent bearing and wearing qualities. Used for brake shoes, bearing caps and engine pistons.

Alcoa 142.—Pistons, brake shoes, air-cooled cylinder heads.

Alcoa B-195.—Pistons, bearing caps and wherever Alcoa 195 sand castings are used.

Alcoa 355.—See information under Alcoa 355 sand castings.

Die Castings

The die casting process is adapted to the production of castings in which extreme accuracy, uniformity and superior finish are essential. In this process very thin walls may be cast, with a consequent saving of weight in the finished part. Holes may be cast to very close tolerances and the dimensions can be controlled so closely as to reduce machining operations to a minimum. Because of the excellent surface, polishing and finishing operations are greatly simplified. In this case the die cost is such that the die-casting process is suitable only for castings which are produced in large quantities. The great advantage of the die-casting process is that it makes possible rapid production of castings which are substantially exact duplicates of each other.

Die castings are made by forcing molten metal under pressure into water-cooled metal dies. In the plunger-type machine the metal is forced into the die by means of a cylinder and piston which are submerged in the molten metal; while in the air-operated machine the metal is forced into the die by air at high pressure on the surface of the molten metal in the goose-neck reservoir. In the press casting process (Harvill process) a roughly measured quantity of almost semi-molten metal is poured from a ladle into a cylinder and is immediately forced into a die by a plunger or ram mounted on a power press. A pressure of about 4,000 to 12,000 lbs. per sq. in. causes the molten metal to fill all parts of the hardened steel die. Pressure and chilling action results in homogeneous, fine grain castings. Due to the rapid chilling, much air can be entrapped with subsequent porosity. All die castings are therefore subject to internal

TABLE VI.—*Composition and Properties of Die Casting Alloys.*

Composition (typical):

Alcoa	Cu	Si	Mg	Al
13	—	12.0	—	Balance.
43	—	5.0	—	Balance.
85	4.0	5.0	—	Balance.
218	—	—	8.0	Balance.

Properties (typical):

Alcoa.	M.S. Tons per sq. in.	Y.P. Tons per sq. in.	Elongation. Per cent.	Brinell hardness.	Charpy impact.
13	14.7	8.0	1.8	80	2.0
43	12.9	5.8	3.5	65	4.5
85	15.6	8.5	2.7	70	2.5
218	16.1	10.3	5.0	—	10.0

porosity, and consequently do not possess high impact strength and ductility.

Sections in die castings can be produced as thin as 0.030 to 0.040 in., although $\frac{1}{8}$ in. is preferred. A section tolerance of ± 0.0025 in. can be held.

Due to the fine grain and dense structure in die castings, a higher corrosion resistance than that for sand castings is obtained.

The more common aircraft die-castings alloys are:—Alcoa 13, Alcoa 43, Alcoa 85, Alcoa 218 and their A.S.T.M. or S.A.E. equivalents. Other manufacturers use their own trade names for these alloys. For detailed data on compositions, properties, etc., see Table VI.

Alcoa 13

It has good casting qualities, highest fluidity and freedom from hot shortness. It has very high strength and good corrosion resistance. It is used for housings, instrument and accessory parts, bomb-rack anchors, air-intake check valves and large intricate castings.

Alcoa 43

See information in paragraphs dealing with sand castings and permanent-mould castings.

Alcoa 85

It has good casting qualities and gives good combination of strength and ductility. It is used for housings, instruments and accessory parts, cockpit enclosure parts, de-icing manifolds, brackets and parts of heavy section.

Alcoa 218

It has excellent resistance to corrosion and excellent strength and ductility. It does not cast as well in intricate castings as Alcoa 13 alloy. It is used for fittings and castings requiring high strength and resistance to corrosion.

Within the limits employed in the die-casting alloys, nickel and zinc appear not to affect the mechanical properties of the high-silicon alloys. Copper increases the strength and reduces the elongation; iron reduces the elongation, and, if extremely high, may reduce the tensile strength; while tin lowers both the strength and elongation. The silicon-aluminium alloys are definitely more corrosion resistant than those containing appreciable amounts of copper. It is possible to produce aluminium die castings of superior corrosion resistance to those heretofore produced by the control of impurities in the 12 per cent. silicon alloy within commercially obtainable limits. All the common impurities in the 12 per cent. silicon alloy, except iron, at least slightly affect the corrosion resistance, copper and tin appearing most undesirable. It is particularly fortunate that iron, the least controllable impurity in die castings, has no detrimental effect on the corrosion resistance within the maximum range likely to be encountered. Iron is difficult to control in the alloy.

Die castings are not widely used for highly stressed parts. Their chief utility is for lightly stressed or virtually unstressed parts.

Plaster Mould Castings

Plaster mould castings are obtained from moulds made by pouring a liquid mixture of gypsum (calcium sulphate), water and suitable binder, such as asbestos, into a flask containing the metal pattern. The moulds are allowed to set and harden, then are removed from the flask and baked at 760 to 815 deg. C. to calcine and dry completely, leaving it very porous to allow gases to escape. The cores are made in the same fashion as the moulds. Castings made by this process can be held to tolerances of ± 0.005 in. and better. The surfaces are almost as smooth as metal mould castings. Many aluminium casting alloys can be cast by this process.

Protection from Corrosion

In contact with moist air, aluminium alloys quickly acquire a thin, impervious film of aluminium oxide, which serves as a protective barrier against further attack. A thicker oxide film can be formed electrolytically where greater resistance to corrosion is required. This is almost mandatory for all aluminium alloy parts for aircraft, especially for naval aircraft.

The process using chromic acid electrolyte can be used on aluminium alloys containing less than about 5 per cent. copper. The castings are suspended by means of aluminium wire and immersed in a 5 to 10 per cent. chromic acid solution. The castings are connected to the positive pole of the electrolytic circuit and current is passed through at 45 volts for 30 to 60 min. while the temperature of the bath is maintained at 35 ± 1 deg. F. This produces an aluminium oxide film on the surface, which film is capable of resisting the attack of a 20 per cent. salt spray solution for over 700 hrs.

The Alumilite process employs sulphuric acid electrolyte and can be used on all aluminium alloys. The castings are suspended by means of aluminium wire and immersed in a dilute sulphuric acid electrolyte. The castings are connected to the positive pole of the electric circuit and current is passed through at 9 to 22 volts at a current density of 8 to 12 amps. per sq. ft. for 30 min. while the temperature is maintained at 20 ± 1 deg. F. The recommended voltage and current density will vary with the alloy composition. This process also produces an aluminium oxide film on the surface, which film is capable of resisting the attack of a 20 per cent. salt spray solution for over 700 hrs.

The porous oxide film produced by both of the processes can be sealed by immersion in boiling water or in a 5 per cent. potassium dichromate solution for 30 min. This additional treatment increases the film's resistance to corrosion still further.

Institute of British Foundrymen

ANNUAL GENERAL MEETING

As previously announced, the Annual General Meeting of the Institute of British Foundrymen will be held at the Midland Hotel, Manchester, on Saturday, July 12, 1941. Following the usual business meetings two technical sessions will be held for the presentation and discussion of Papers. The programme is as follows:—

10.30 a.m. to 1 p.m.—Council and Committee Meetings (Room 104) (open to Council and Committee Members only).

1 to 2 p.m.—Luncheon in the Derby Room (Members, ladies and other guests). (Tickets, price 6s. 6d., on application.)

2 to 2.45 p.m.—Annual General Meeting. Induction of Officers and awards of Medals (Lancaster Room).

2.45 to 3 p.m.—Presidential Address.

3.15 p.m.—Presentation and discussion of Papers:—

Session A (Lancaster Room): "American Synthetic Sand Practice," by N. J. Dunbeck. (Presented on behalf of the American Foundrymen's Association.) The Paper will be presented by Mr. J. J. Sheehan, A.R.C.Sc.I., A.I.C. "Mould and Core Washes; their Preparation and Possible Methods of Testing," by W. Y. Buchanan.

Session B (Room 104): "Moulding Steam Valve Lids for Marine Service," by F. Hudson. A Paper on "British National Specifications for Cast Iron," by J. G. Pearce, M.Sc., M.I.E.E., F.Inst.P. (Presented on behalf of the British Cast Iron Research Association.)

Those wishing to attend the luncheon should make application for tickets prior to June 30, 1941. Preprints of the Papers will be available before the meeting, and further particulars may be obtained from the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, 3.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

To the Editor of THE FOUNDRY TRADE JOURNAL.

Melting Borings

SIR,—I find that a simple method to dispose of the borings made in a works having their own foundry, is to take advantage of the heat in the cupola after finishing the day's work by adding an extra charge of coke, and reduce the blast volume and pressure. This will melt the weight of borings used in a normal charge of iron, the resultant metal being pigged and added to the metal charges next day. This method shows a commercial profit.—Yours, etc.,

Walter Slingsby & Company, Limited,
WALTER SLINGSBY,
Director.

Keighley,
May 18.

The Polishing of Cast-Iron Micro-Specimens and the Metallography of Graphite Flakes

(*Continued from page* 345.)

very small graphite "flakes" having no particular orientations with respect to each other.

Conclusion

It has been shown that the graphite flakes in grey cast iron can be retained quite easily during the polishing operation with but few changes in normal recommended procedures. The ideal to aim for is a smoothly polished metallic matrix free from surface distortions and smoothly polished graphite flakes with no burnishing or flowing of the metallic matrix over the graphite flakes. Only with specimens prepared in this way can any accurate idea be obtained of the size, shape and internal structure of graphite flakes. The process which has been described here enables the complete preservation of the graphite flakes and the polishing operation, if correctly adhered to, produces specimens perfectly prepared for photomicrography.

The polishing procedure given here has the advantage that it is a comparatively rapid method of specimen preparation and the stages are quite simple. It is rather difficult to give any accurate times for the preparation of specimens, but as a rough guide it can be said that it should be possible to prepare a specimen of a cross-section from a 0.875-in. dia. test bar in 15 min., that is including cutting, grinding, rubbing down, and polishing and etching. The actual time required for specimen preparation by this method is to some extent a function of the number of times the specimen is etched and repolished, and this again depends on the structure of the specimen and on the perfection required. For the routine visual examination of cast irons, it is frequently unnecessary to have the graphite flakes perfectly prepared. In these cases only a rough idea of the general structure is needed and the number of polishing and etching operations can be reduced to a minimum. However, no specimen should have less than three polishings and etchings, and in only a very few cases should it be necessary to polish and etch more than ten times to obtain a perfectly prepared specimen. The repeated etching and polishing operation not only improves the appearance of the graphite structure, but also gives a better finish to the metallic matrix and the adoption of this type of technique is advisable in the preparation of specimens taken from nearly every type of ferrous and non-ferrous alloy.

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The Week's News in Brief

Trade Talk

THE STEEL CORPORATION OF BENGAL, LIMITED, has declared a half-yearly preference dividend, payable June 1, at 5 per cent. per annum, plus 1 per cent. arrears up to May 31, 1938.

SIR DAVID MILNE-WATSON, governor of the Gas Light & Coke Company, will be the first president of the Gas Research Board which has been registered as a company limited by guarantee, without capital.

BARON ABERTAY, of Bankfoot, Perthshire, shipowner, chairman of Metal Traders, Limited, and a director of the L.N.E.R., the British Oxygen Company, Limited, and other companies, left £296,518.

THE AMERICAN GRAY IRON FOUNDERS SOCIETY is making a national survey to ascertain consumption of all raw materials by grey iron foundries in 1940 and anticipated consumption in 1941, according to Mr. W. W. Rose, executive secretary.

THE BOARD OF TRADE have appointed Mr. A. D. Carmichael to be Regional Controller of Factory and Storage Premises for the Midland Region. The address of the Control in the Midland Region is, for the time being, 40, Summer Row, Birmingham.

THE SIR JOHN KENNEDY MEDAL of the Engineering Institute of Canada was presented to Lieutenant-General A. G. L. McNaughton, commander of the Canadian Corps, by Mr. J. R. Beard, president of the Institution of Electrical Engineers, in London on May 8.

THE FIRST electric steelmaking furnace in the Youngstown district by any of the large steel companies was recently put in operation by the Sharon Steel Corporation. The furnace is a 20-ton unit, with a monthly capacity of about 3,000 tons of alloy, stainless and high-carbon steel.

THE NET PROFIT of the International Nickel Company of Canada, Limited, for the three months ended March 31 amounted to $9,239,709 after all charges, depreciation, taxes, etc., equivalent to 60 cents a share of common stock. This compares with $9,119,668, or 59 cents a common share, in the preceding quarter.

THE NOMINAL CAPITAL of A. Reyrolle & Company, Limited, manufacturing electrical engineers, Hebburn, Co. Durham, has been increased by £250,000 in £1 shares to £1,250,000. The directors are authorised to convert the new shares, when issued and fully paid, into ordinary stock transferable only in units or multiples of £1.

THE SWEDISH GRANGESBERG iron-ore trust made a net profit of 14 million cr. last year, against 39 million in 1939; an unchanged dividend of 12 cr. per share has been paid. The company reports difficulties in the ore trade, especially owing to the stoppage of trade through Narvik and the shortage of shipping and bad weather conditions in the Baltic. During the year the company lost nine vessels as a result of acts of war.

THE AEROGRAPH COMPANY, LIMITED, manufacturers of spray-painting equipment and air-brush equipment, have found it necessary to transfer their London business from their City offices and showrooms to their factory and general offices at Lower Sydenham, London, S.E.26 (telephone: Sydenham 6060). Duplicates of any letters or orders addressed to 43, Holborn Viaduct, and posted during May 9 or 10, and also particulars of any goods that may have been sent there during that period should be sent to Lower Sydenham.

THE MINISTRY OF SUPPLY have issued Direction No. 4 under the Control of Iron and Steel (No. 8) Order, 1940, which came into operation on May 17, 1941, providing for an increase in the maximum price of hematite iron ore mined in Cumberland, Lancashire and Glamorgan, from £1 6s. per ton to £1 7s. 6d. per ton for a standard grade, with a sliding scale based on iron and silica contents. There was a corresponding increase of 1s. 6d. per ton (to 43s. 6d.) in the special grade of this ore used in steel furnaces. The new price takes account of the increased costs incurred in the production of the ore. Copies of the above-mentioned Direction may be obtained from H.M. Stationery Office, York House, Kingsway, W.C.2 (price 1d.).

THE MANNER IN WHICH WAR RESEARCH in Canada is aiding the munitions industry was outlined by Lieut.-General A. G. L. McNaughton, Commanding the Canadian Oversea Force, in an address to the Royal Society of Arts recently. General McNaughton, who is President of the National Research Council of Canada, traced the development of research organisation in Canada since the last war, which, he said, had given them laboratories and trained staffs competent to act as a nucleus in undertaking the study of the problems presented in almost every field of war requirements. In addition to largely increased Government funds, a number of Canadian corporations and private individuals had established a trust fund of well over $1,000,000, with more available if required. The committee had been enjoined by the donors to ensure that no worth-while project of research sponsored by the National Research Council should be delayed or hampered by lack of money. The mining industries of Canada had been conspicuous for their generous help in research and the support given to the Canadian Corps in the organisation and equipment of the tunnelling companies. One of these was now at Gibraltar making effective use of the modern machinery presented by the Canadian mining industry. The other company was using similar equipment in this country. Research Enterprises, Limited, a Government corporation, had been set up by the Canadian Ministry of Supply primarily to produce for the armed forces and for industry inventions and apparatus developed in the Council's laboratories. In the field of radiology special attention had been paid in the Council's laboratories for many years to the examination of castings, particularly those in light alloys required to carry stress in aircraft construction.

Personal

MR. EDWARD J. BRYDEN, A.C.A., has been appointed a director of Cannon Iron Foundries, Limited, Deepfields, near Bilston, Staffs.

MR. WALTER GARDNER has been elected chairman of Henry Gardner & Company, Limited, metal merchants, in place of the late Mr. Henry Gardner.

THE CLYDE NAVIGATION TRUSTEES have appointed Mr. James Macfadzean, assistant engineer, who has been in the service of the Trust since 1920, to succeed Mr. A. C. Gardner, who has resigned for health reasons.

Obituary

MR. HARRY BROADBENT, proprietor of the Park Street Foundry, Ashton-under-Lyne, died recently.

MR. FRANK WAUGH CHADDERTON, a former director of Platt Bros. & Company, Limited, engineers, of Oldham, died on May 4, in his 80th year.

MR. FREDERICK FULLER, engineer and iron and brass founder, of the Speedwell Engineering Works, Tunstall, Stoke-on-Trent, died last week, aged 61.

MR. HERBERT HOLT, chairman of Thomas Holt, Limited, engineers and ironfounders, of Rochdale, died recently at the age of 64. He was the fourth and last surviving son of the late Mr. Thomas Holt, the founder of the firm.

MR. THOMAS O. CALLENDER, director of Callender's Cable & Construction Company, Limited, and Thomas Bolton & Sons, Limited, metal melters and tool makers, Liverpool, died in a nursing home at Southborough, Kent, on Saturday, May 10, aged 43.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Metal Hardeners, Limited—Capital, £500. Subscriber: W. Crawley, 112-114, Fenchurch Street, London, E.C.3.

South London Foundry, Limited, 8, Clarence Avenue, London, S.W.4—Capital, £3,000. Directors: J. A. Rushton and K. Moore.

Dutson & Company, Limited, 11, Whittall Street, Birmingham, 4—Capital, £60,000. Brassfounders, etc. Directors: J. R. Dutson James and J. M. James.

Steel & Alloy Productions, Limited—Capital, £2,500. Directors: Sir W. Peacock, "Trenarth," Mawnan, Cornwall; W. Somers, H. B. Hargreaves, and A. Carter.

Edward H. Thew (Brassfounders), Limited, 4, Dean Street, Newcastle-upon-Tyne—Capital, £1,000. Directors: R. Shaw, G. T. Wilson, E. McDowell, and J. C. Harrison.

Maclon, Limited, Bush Lane House, Cannon Street, London, E.C.4—Capital, £1,000. Dealers in metals, scrap and metal goods, etc. Directors: F. C. Spencer London and J. D. Macmillan.

Contracts Open

Leeds, May 26—Tinplates, black and galvanised iron, lead-coated iron, brass fittings, best merchant iron and mild steel, bolts and nuts, flexible metallic tubes, white lead, wrought iron and steel tubes and fittings, cast-iron pipes, iron castings, etc., for 12 months, for the Gas Committee. Mr. C. S. Shapley, engineer and general manager, Gas Offices, Market Hall, Leeds, 2.

Beverley, May 27—Provision and jointing of approx. 1,900 yds. of 3-in. spun iron water main, etc., for the Rural District Council. The Engineer and Surveyor, 36, Market Place, Beverley, Yorks. (Fee £1 1s., returnable.)

Reports and Dividends

Mason & Burns, Limited—Dividend of 20 per cent. (12½ per cent.).

Babcock & Wilcox, Limited—Final ordinary dividend of 6 per cent., plus a cash bonus of 1 per cent., making a total for the year of 11 per cent.

Hopkinsons, Limited—Profit for the year to January 31, £240,600 (against £209,131); taxation, £186,495 (£104,187); ordinary dividend of 15 per cent. (same); carried forward, £56,545 (£44,090).

Robey & Company, Limited—Trading profit for 1940, £39,526; balance, after providing for interest, depreciation, etc., £29,310; brought in, £11,389; taxation and War Damage Act Insurance, £22,500; dividend of 5 per cent. on the non-cumulative preference shares, £3,017; dividend of 5 per cent. on the ordinary shares, £3,905; carried forward, £8,789.

Ransomes, Sims & Jefferies, Limited—Net profit for 1940, after providing for E.P.T. and income tax, and writing off expenditure on A.R.P., £85,142 (against £75,436); brought in, £54,080; dividend on preference shares, £11,000; to reserve for post-war reconstruction and contingencies, £35,000; dividend on the ordinary stock of 7½ per cent. (same); carried forward, £55,723.

Stewarts and Lloyds, Limited—Consolidated profit, including the company's proportion of the profits of subsidiary companies, after providing for depreciation, E.P.T., N.D.C., and income tax, £1,181,107 (against £1,452,445 for 1939); net profit (which includes the results of subsidiary companies to the extent to which dividends have been declared), £1,008,361 (£1,213,740); brought in, £181,809 (£179,544); reserve for contingencies, £350,000 (£500,000); dividends on the cumulative preference stocks, £123,431; dividend of 12½ per cent. on the deferred stock, and at the appropriate rate on the 625 liaison deferred shares, £534,050; carried forward, £182,689.

Steelworks Accident Record

The "Midvale Safety Bulletin" reports that the South Chicago works of the Republic Steel Corporation maintained an accident frequency rate of only 1.20 accidents per million man-hours, as there were four lost time accidents in 3,332,250 man-hours.

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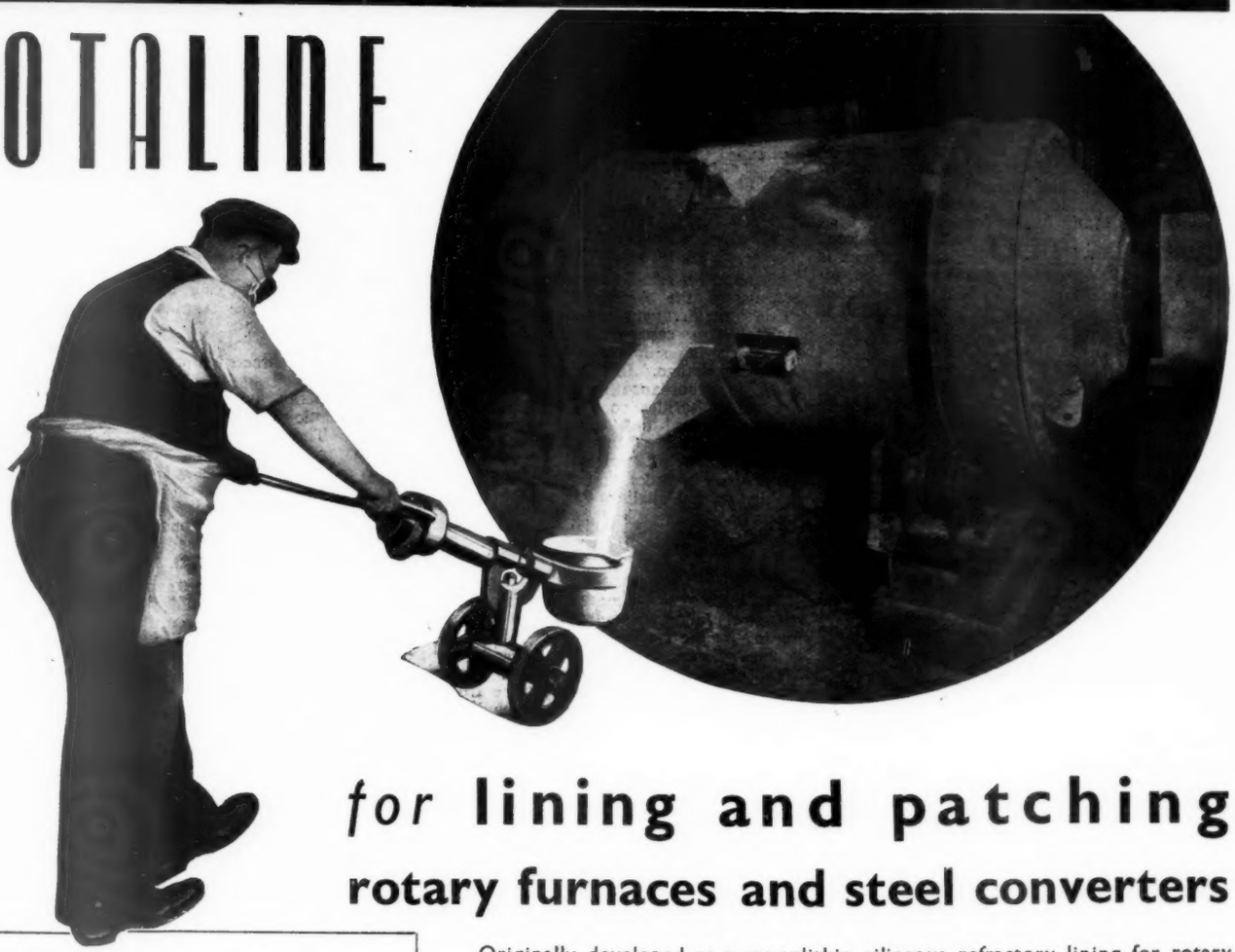

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ACID-PROOF REFRACTORIES: *Obsidianite, Losol.*

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SILICA BRICKS: *Lowood, Meltham, Allen, Quartex.*
CEMENTS: *Sintex, Durax, Pyrolyte.* PLASTICS: *Durax, Rotaline, Plastic K-N., Glendoline, Ground Ganister., Steel Moulders' Composition.* SILLIMANITE: *Tank Blocks, Bricks and Cements.* SANDS: *Moulding, Brick Facing, Silica, Glass.*

Raw Material Markets

Little, or no, difficulty is experienced by the light-castings trade in securing all the iron they require to meet current needs, and, in fact, many consumers have been able to place moderate tonnages in stock. Fresh supplies are, of course, subject to licence, but permits are being granted quite freely. While makers of light castings use high-phosphorus iron in the main, the chief requirements of heavy engineers are better quality irons, such as low-phosphorus iron and hematite, which, being produced from imported ores, are much more difficult to obtain. Many heavy founders have been able to utilise high-phosphorus and refined irons in their mixtures on a freer basis, but there is naturally a limit to which mixtures can be rearranged and much larger quantities of the better class irons would readily pass into consumption if available.

Pig-Iron

MIDDLESBROUGH—There is no sign of easier conditions prevailing among heavy-castings manufacturers, who are fully booked up over some time to come. These makers are for the most part employed on contracts for various Government departments, and replacement orders are quickly made available, so that continuous operations are assured. In the light foundry trade, activity is confined within narrow limits, many works being engaged well below capacity owing to the failure of the trade to acquire sufficient business of national importance to make up for the loss of orders brought about by wartime contingencies. No delay is apparent in the delivery of foundry iron from the Midlands and many users have stocks on hand. Iron producers in the Cleveland district are engaged on the manufacture of steel-making irons, for which there is very strong pressure.

Only really urgent demands for hematite are being entertained, as home output is much below the level of consumption, and it is still necessary to utilise foreign iron to cope with high-priority orders. Thus, many hematite consumers have been compelled to readjust their mixtures to incorporate high-phosphorus and refined irons and steel scrap, and the results obtained have been gratifying, although freer supplies of hematite would, of course, be welcomed.

LANCASHIRE—There is little change in the demand for pig-iron from week to week; speciality engineers, machine-tool makers, etc., being employed on work of national importance, are making impressive calls on outputs, but the position in respect of light-castings and jobbing foundries remains disappointing, with little prospect of any material improvement occurring in the near future. Local consumers of iron are obtaining all they require from the Midlands. There is quite a good demand for refined qualities of iron, and consumption of these grades tends to expand.

MIDLANDS—The supply of high-phosphorus iron is plentiful to meet the rising needs of industry, and deliveries are quite satisfactory, despite the fact that more of this type of iron is now being consumed by heavy engineers. Ample tonnages of ore are forthcoming from home sources for the manufacture of high-phosphorus iron, which is the chief reason that this iron is so much more easily obtained than better quality materials. Consumption in the light-castings trade is not high, as works in this section cannot operate at capacity. Machine-tool works and other heavy engineering concerns, on the other hand, are booked up well ahead on important contracts, and are making pressing calls on producers of hematite and low-phosphorus iron.

SCOTLAND—Urgent demands for foundry pig-iron are being satisfied, but deliveries generally are behind schedule, and it has not been possible for users to build up reserve stocks. Basic iron is available in large tonnages, but the hematite position remains very tight. While activity in the heavy engineering industry is fully sustained, business in light castings does not show much improvement, only comparatively few of the Falkirk foundries being able to operate on a full-time basis.

Coke

A steady business continues to be done in foundry coke, and supplies are sufficient to enable consumers to place tonnages into stock in addition to meeting current requirements. The present minimum quotation, as fixed by the Control, is 61s. 6d. per ton, delivered Birmingham and Black Country stations, but forward business is conducted subject to a rise-and-fall clause.

Steel

Demand for steel is unremitting and, although the outputs of the American industry are open to British requirements, home production is being maintained at capacity levels in view of the need for conserving shipping space and the balance of foreign exchange. British outputs are being distributed in accordance with the instructions of the Control authorities, so that makers are relieved of the complicated task of placing deliveries in the right channels. Consumption of ordinary commercial grades of steel is being restricted as much as possible in order that the capacity of the plant making special qualities for munitions, etc., may be enlarged.

Scrap

The bulk of the demand for scrap emanates from the steel industry, and it is in the descriptions needed by the steelworks that the shortage is most acute. Scrap for the ironfoundries is quite plentiful, and buyers are able to purchase more than their immediate supplies. The Iron and Steel Control are regulating the distribution of scrap according to the urgency of demands, and everything is being done to curtail purchases of scrap abroad

Metals

TIN—No official statement was issued after an extra-ordinary meeting of the International Tin Committee held in London last Thursday, but it is believed that a draft agreement covering the proposed next restriction period beginning on January 1 was drawn up for presentation to the signatory Governments. No figures of standard tonnages for the next restriction period were included in the agreement. A recommendation as to standard tonnages believed to be based on output at 130 per cent. of standards for the year to June next was sent to the signatory Governments for approval, but their decisions have not yet been made known. It is hoped that Bolivia will accept an allotment of 40,000 tons, as against 46,000 tons now allotted, which would permit Malaya's allotment to be raised to 88,000 tons, as compared with 77,000 tons now, and the Dutch East Indies could also receive an extra allotment of 11,000 tons.

Another point with regard to the tin restriction scheme is the attitude of the Government of Thailand. It is known that Japan has attempted to influence the Thailand authorities to retire from the agreement and to sell all her output to Japan. It may be significant that Thailand was represented at the London meeting of the I.T.C., but it has been reported that English and Australian tin and rubber producers operating in Thailand have been requested to sell their products direct to the Bangkok Government. Thailand produces only about 17,500 tons of tin in concentrates a year (about 7½ per cent. of the world output), and there are no smelters outside the British Empire to treat it unless shipments of concentrates are made *via* Japan and Siberia to Germany and Holland.

Trading in tin on the London market has been rather dull of late, and on Monday, for the first time since the Ministry of Supply became actively engaged in market operations, no offers of cash tin were made from that quarter. It is thought that, as the London quotation is, if anything, below New York parity, offers on account of the Ministry are rendered largely unnecessary. It is understood that the American Government has now definitely authorised the purchase of up to 150,000 tons of tin, although it is believed that actual orders to date cover no more than about 57,000 tons. It is further reported that the Metals Reserve Company has extended its tin contract up to the end of the year, involving an additional 37,500 tons. Consumers in the United States mostly have good-sized stocks on hand, but business remains brisk.

Tin prices on the London Metal Exchange during the past week have been as follow:—

Cash—Thursday, £269 15s. to £270; Friday, £268 10s. to £268 15s.; Monday, £267 10s. to £268; Tuesday, £267 10s. to £267 15s.

Three Months—Thursday, £267 15s. to £268; Friday, £267 to £267 5s.; Monday, £266 10s. to £267; Tuesday, £266 10s. to £266 15s.

COPPER—Distribution of copper has been carefully controlled for some time past, but it is possible that even closer scrutiny will be made of fresh applications for licences in the future. The position at present is that essential users of the metal are getting all they require, but there is little, or no, surplus for other consumers. In America, too, supplies of the red metal are being carefully conserved; the Metals Reserve Company has contracted up to the end of April last to take delivery of 500,500 tons of copper from Latin America, which represents nearly a year's production at the current rate of output.

The figures of the United States Copper Institute for April are as follow:—Production of crude copper, 88,271 tons (March, 85,643); production of refined, 88,659 tons (95,322); deliveries to domestic consumers, including 42,858 tons of Latin-American copper, 123,580 tons (134,333); export shipments, 49 tons (6); refined stocks at the end of April, 97,761 tons (89,873).

SPELTER—Stocks of zinc in the United States increased from 6,969 short tons in March to 7,311 tons in April, according to the statistics of the American Zinc Institute. This is the first occasion on which a monthly increase has been recorded for exactly twelve months and, although the expansion in stocks is trifling, it is very welcome in view of the very low level to which supplies have fallen. Zinc is, of course, an important metal in the American production drive, and current stocks amount to rather less than four days' supply based on the rate of deliveries in April. This situation is, perhaps, less serious than it may appear at first sight, as the rate of deliveries has shown little advance over the past nine months, due to the necessity for maintaining the balance between production and consumption. Plans are already in operation for the raising of outputs, but there is no doubt that any additional supplies forthcoming will be quickly taken up. In the United Kingdom, supplies are largely restricted to the needs of Government priority users.

LEAD—Chief consumers of lead are the cable and battery makers and other industries employed on Government contracts, and ample supplies are available to meet their requirements. The demand from most other sources is below the average level.

SCRAP—Good sales of non-ferrous scrap are being made in most sections of the trade, and larger supplies of certain classes would be welcomed. In particular, anti-friction metal is wanted, and supplies are less plentiful owing to the smaller number of old cars coming forward. The chief drag on the market at present is lead, drosses being more especially difficult to move. A considerable tonnage of scrap lead is being obtained from buildings damaged by enemy action.

Solubility of Sulphur Dioxide in Molten Copper

In a Paper of the above title by C. F. FLOE and J. CHIPMAN, presented to the American Institute of Mining and Metallurgical Engineers, the authors describe experimental work on the determination of the solubility of sulphur dioxide in molten copper over a pressure range from about 20 mm. Hg to 900 mm. Hg, and temperatures from 1,100 to 1,500 deg. C. The data obtained show that the solubility cannot be interpreted by postulating any simple chemical reaction between the gas and the metal. The normal equation for solution, viz., $6\,Cu + SO_2 - Cu_2S + 2Cu_2O$, does not hold, particularly at low pressures, which apparently is due to some irregular behaviour of the dilute solutions. This discrepancy cannot be readily explained on the basis of present knowledge of the nature of solution of gases in molten metals. The Paper is published in a recent issue of "Metals Technology."